E Series Multifunction DAQ
16-Bit, 333 kS/s, 16 Analog Inputs

NI 6052E

- 16 analog inputs at 333 kS/s, 16-bit resolution
- 2 analog outputs at 333 kS/s, 16-bit resolution
- 8 digital I/O lines (5 V TTL/CMOS); two 24-bit counter/timers
- Analog and digital triggering
- 15 analog input signal ranges
- NI-DAQ driver simplifies configuration and measurements

Models

- NI PCI-6052E
- NI PXI-6052E
- NI DAQPad-6052E for FireWire ***NEW!***

Operating Systems

- Windows 2000/NT/XP/Me/9x*
- Mac OS 9*
- Real-time performance with LabVIEW (page 134)
- Others such as Linux (page 187)

Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio for Visual Basic
- VI Logger

Other Compatible Software

- Visual Basic
- C/C++

Driver Software (included)

- NI-DAQ

Calibration Certificate Included

See page 21

* See ordering information

NEW

Overview and Applications

NI 6052E devices use E Series technology to deliver high-performance, reliable data acquisition (DAQ) capabilities. These devices are used in a broad variety of applications, including:

- Continuous high-speed data logging at up to 333 kS/s
- Control where synchronization between analog input (AI), analog output (AO), and counter/timers is required
- Portable data acquisition
- High-voltage and sensor measurements when used with NI signal conditioning (see page 244)
- High-channel-count system scalability with RTSI or PXI trigger bus

Figure 1. DAQPad-6052E for FireWire (Mass Termination Version)

Features

NI 6052E devices feature temperature-drift-protection circuitry that minimizes the effect of ambient temperature changes around the NI data acquisition device. The temperature drift on the NI 6052E is less than 0.0006% of reading per °C, ensuring accuracy in all environments. These devices also offer resolution improvement technologies such as dithering to reduce quantization error. This technology permits NI 16-bit multifunction DAQ devices to perform with an effective input resolution of at least 18-bits. For a full description of NI accuracy advantages, see page 188. These devices offer several methods for connecting signals including differential for eight AI channels and maximum noise elimination, as well as single-ended and nonreferenced single-ended for 16 AI channels.

NI 6052E devices feature analog and digital triggering, as well as two 16-bit analog outputs, two 24-bit 20 MHz counter/timers, and eight digital I/O lines compatible with both 5 V TTL and CMOS.

INFO CODES

For more information, or to order products online visit ***ni.com/info*** and enter:

pci6052e
pxi6052e
daqpad6052e

BUY ONLINE!

Portable Configurations

The NI DAQPad-6052E for FireWire combines the 16-bit measurement capability of the NI 6052E family with the high-bandwidth capabilities of the FireWire communication bus to provide a portable, high-performance, 16-bit DAQ solution. It is available in two configurations – mass termination and BNC termination. Both configurations feature 250 V functional isolation from the PC and a low-profile package that fits under your laptop computer. The BNC model is ideal for applications in which portability and quick connectivity are needed, such as in-vehicle

Family	Bus	Analog Inputs	Resolution	Sampling Rate	Input Range	Analog Outputs	Resolution	Output Rate	Output Range	Digital I/O	Counter/ Timers	Triggers
NI 6052E	PCI, PXI, FireWire	16 SE/8 DI	16 bits	333 kS/s	±0.05 to ±10 V	2	16 bits	333 kS/s	±10 V	8	2, 24 bit	Analog and Digital

Table 1. NI 6052E Channel, Speed, and Resolution Specifications (See page 238 for detailed specifications.)

E Series Multifunction DAQ
16-Bit, 333 kS/s, 16 Analog Inputs

Nominal Range (V)		Absolute Accuracy							Relative Accuracy	
		% of Reading		Offset	Noise + Quantization (μV)		Temp	Absolute Accuracy	Resolution (μV)	
Positive FS	Negative FS	24 Hrs	1 Year	(μV)	Single Pt.	Averaged	Drift (%/°C)	at Full Scale (mV)	Single Pt.	Averaged
10.0	-10.0	0.0354	0.0371	947.0	981.0	87.0	0.0006	4.747	1145.0	115.0
5.0	-5.0	0.0054	0.0071	476.0	491.0	43.5	0.0001	0.876	573.0	57.3
2.5	-2.5	0.0354	0.0371	241.0	245.0	21.7	0.0006	1.190	286.0	28.6
1.0	-1.0	0.0354	0.0371	99.2	98.1	8.7	0.0006	0.479	115.0	11.5
0.5	-0.5	0.0354	0.0371	52.1	56.2	5.0	0.0006	0.243	66.3	6.6
0.25	-0.25	0.0404	0.0421	28.6	32.8	3.0	0.0006	0.137	39.2	3.9
0.1	-0.1	0.0454	0.0471	14.4	22.4	2.1	0.0006	0.064	27.7	2.8
0.05	-0.05	0.0454	0.0471	9.7	19.9	1.9	0.0006	0.035	25.3	2.5
10.0	0.0	0.0054	0.0071	476.0	491.0	43.5	0.0001	1.232	573.0	57.3
5.0	0.0	0.0354	0.0371	241.0	245.0	21.7	0.0006	2.119	286.0	28.6
2.0	0.0	0.0354	0.0371	99.2	98.1	8.7	0.0006	0.850	115.0	11.5
1.0	0.0	0.0354	0.0371	52.1	56.2	5.0	0.0006	0.428	66.3	6.6
0.5	0.0	0.0404	0.0421	28.6	39.8	3.0	0.0006	0.242	48.2	3.9
0.2	0.0	0.0454	0.0471	14.4	22.4	2.1	0.0006	0.111	27.7	2.8
0.1	0.0	0.0454	0.0471	9.7	19.9	1.9	0.0006	0.059	25.3	2.5

Note: Accuracies are valid for measurements following an internal E Series calibration. Averaged numbers assume dithering and averaging of 100 single-channel readings. Measurement accuracies are listed for operational temperatures within ±1 °C of internal calibration temperature and ±10 °C of external or factory-calibration temperature. One-year calibration interval recommended. The absolute accuracy at full scale calculations were performed for a maximum range input voltage (for example, 10 V for the ±10 V range) after one year, assuming 100 pt averaging of data. See overview on page 194 for example calculations.

Table 2. NI 6052E Analog Input Accuracy Specifications

Nominal Range (V)		Absolute Accuracy					
		% of Reading			Temp		Absolute Accuracy
Positive FS	Negative FS	24 Hrs	90 Days	1 Year	Offset (μV)	Drift (%/°C)	at Full Scale (mV)
10	-10	0.0044	0.0052	0.0061	798	0.0001	1.405
10	0	0.0044	0.0052	0.0061	569	0.0001	1.176

Note: Temp Drift applies only if ambient is greater than ±10 °C of previous external calibration. See page 194 for example calculations.

Table 3. NI 6052E Analog Output Accuracy Specifications

automotive testing and laboratory measurements. The NI DAQPad-6052E can be powered by any 9 to 25 VDC power supply such as a car battery. The unit comes with a universal AC-to-DC power supply that can interface to standard power outlets anywhere in the world. You can also use the optional BP-1 rechargeable battery pack to power the device for up to 2.5 hours. Refer to page 215 for a more comprehensive look at our portable DAQ products as well as portable DAQ accessories.

Driver Software

NI-DAQ is the robust driver software included with all National Instruments data acquisition and signal conditioning products. This easy-to-use software tightly integrates the full functionality of your DAQ hardware to LabVIEW, LabWindows/CVI, and Measurement Studio for Visual Basic. High-performance features include multidevice synchronization, networked measurements, and DMA data management. Bundled with NI-DAQ, the Measurement & Automation Explorer utility simplifies the configuration of your measurement hardware with device test panels, interactive measurements, and scaled I/O channels. NI-DAQ also provides numerous example programs for LabVIEW and other application development environments to get you started with your application quickly.

Services and Support/Training

As a complement to your data acquisition and signal conditioning product, consider:

- Technical Support – Included in hardware/software purchase through Applications Engineers worldwide, Web resources with more than 1000 example programs and more than 7000 KnowledgeBases, and Premier Support – ***ni.com/support***
- NI Factory Installation Services (FIS) – Software and hardware installed in PXI and PXI/SCXI systems, tested and ready to use – ***ni.com/advisor***
- Calibration – Includes NIST-traceable basic calibration certificate, services for ANSI/NCSL-Z540 and periodic calibration – ***ni.com/calibration***
- Extended Warranty – Meet project life-cycle requirements and maintain optimal performance in a cost-effective way – ***ni.com/services***
- Data Acquisition Training – Instructor-led courses – ***ni.com/training***
- Professional Services – Feasibility, consulting, and integration through our Alliance Program members – ***ni.com/alliance***

For more information on NI services and support, visit ***ni.com/services***

E Series Multifunction DAQ
16-Bit, 333 kS/s, 16 Analog Inputs

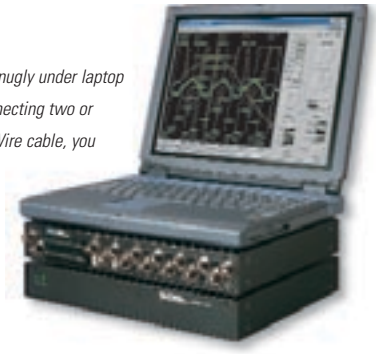


Figure 2. The NI DAQPad-6052E fits snugly under laptop PCs for portable applications. By connecting two or more DAQPad-6052E units with FireWire cable, you can use several devices with one PC.

Related Products

For related products, please refer to:

- SCXI Signal Conditioning – page 246
- SCC Signal Conditioning – page 320
- Analog Output Multifunction DAQ – page 365
- High-Speed Digital I/O – page 378

See page 221 for connector diagrams.

See page 238 for more detailed specifications.

Ordering Information

NI PCI-6052E 777745-01
NI PXI-6052E 777962-01
NI DAQPad-6052E[1] for FireWire with
  mass termination, AC adapter, and FireWire cable
    US 120 VAC.....778535-01
    Universal Euro 240 VAC 778535-04
    United Kingdom 240 VAC 778535-06
  BNC termination, AC adapter, and FireWire cable
    US 120 VAC.....778536-01
    Universal Euro 240 VAC 778536-04
    United Kingdom 240 VAC 778536-06

Includes NI-DAQ driver software.

[1]Compatible with Windows 2000/XP/Me/98 only.

Accessories

BP-1 rechargeable battery pack
  120 VAC charger 776896-01
  230 VAC charger 776896-31
DAQPad accessories
  Rack-mount kit.....777665-01
  Stacking kit 777666-01

For information on extended warranty and value-added services, see page 20.

Recommended Configurations

Family	DAQ Device	Accessory	Cable
NI 6052E	PCI-6052E	SCB-68 (776844-01)	SH6868-EP (184749-01)
	PXI-6052E	TB-2705 (778241-01)	SH6868-EP (184749-01)
	DAQPad-6052E (mass termination)	CA-1000[1] (777664-01)	SH6868-EP (184749-01)
	DAQPad-6052E (BNC termination)	none	none

[1]See page 352 for information on CA-1000.

For E Series accessory and cable information, see page 221.

Multifunction DAQ Overview

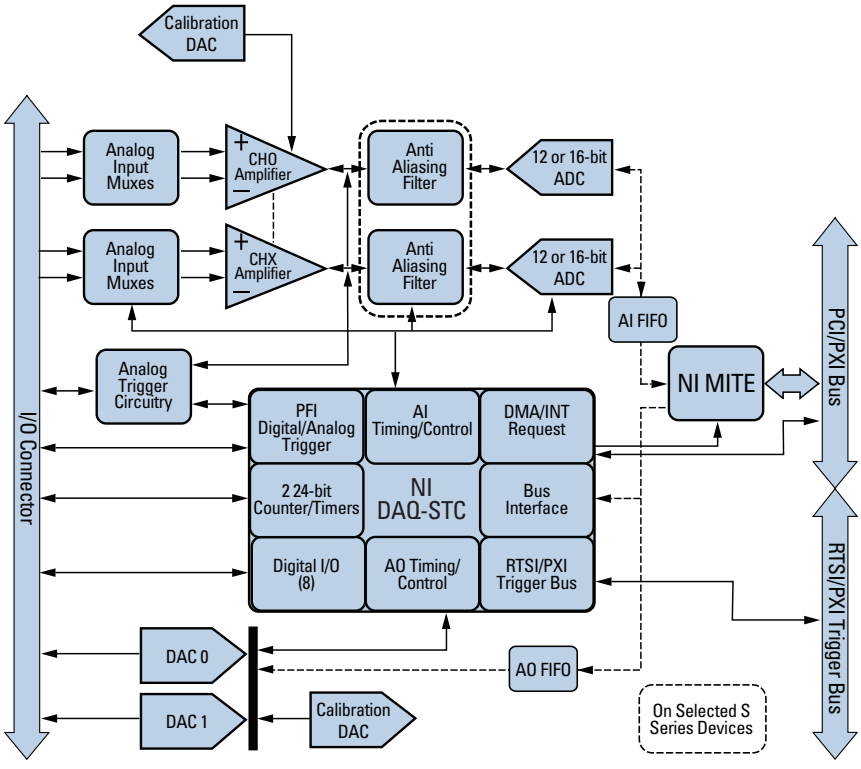


Diagram 1. S Series Diagram

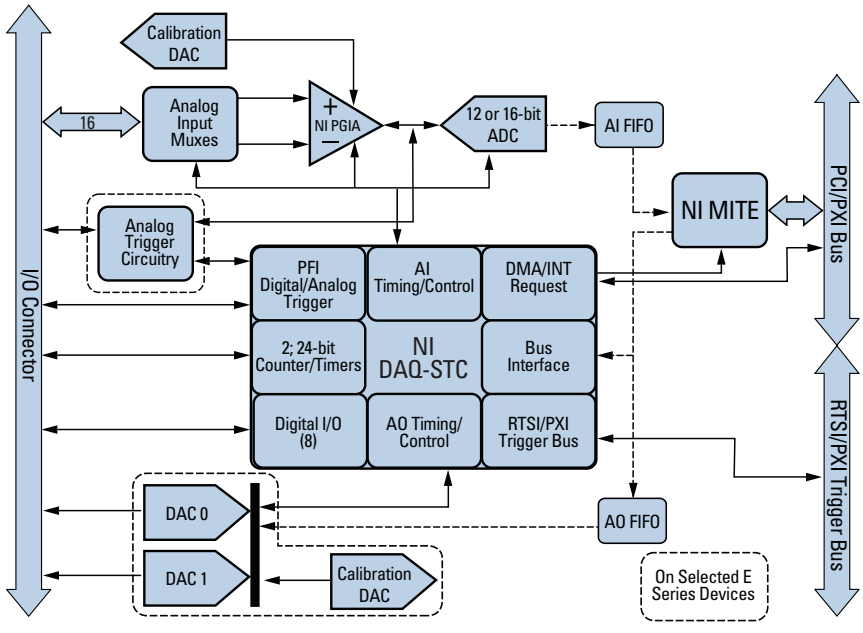


Diagram 2. E Series Diagram

Driver Software for Data Acquisition and Signal Conditioning

NI-DAQ

- Driver software for NI data acquisition and signal conditioning hardware
- Short time to first measurement with quick configuration and application-specific example programs
- Named and scaled channels remove configuration complexity
- Multiple-device synchronization and integration with RTSI or PXI trigger bus
- Networking features for remote and distributed measurements
- Robust double-buffered DMA data management routines

Operating Systems

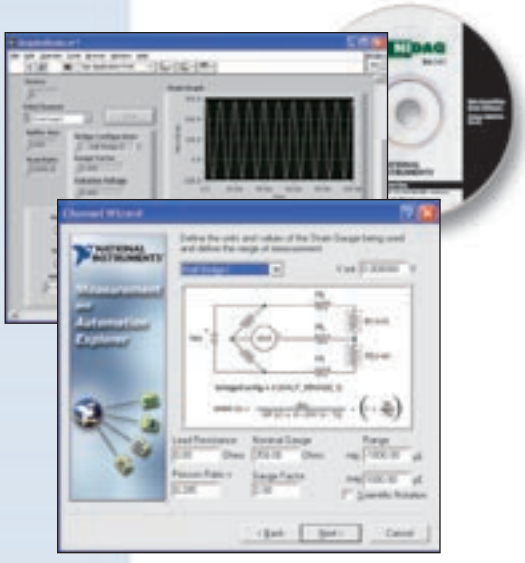
- Windows 2000/NT/XP/Me/9x
- Mac OS 9
- Others such as Linux (see page 187)
- Real-Time performance with LabVIEW (page 134)

Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio for Visual Basic
- VI Logger

Other Compatible Software

- Visual Basic
- C/C++



Overview

The quality of your configuration and driver software is just as important as the quality of your measurement hardware. NI-DAQ is a robust, time-proven driver for NI data acquisition and signal conditioning hardware. This software helps you quickly install your device and begin taking measurement data. NI-DAQ includes hundreds of application examples to jump-start your application development. NI-DAQ delivers the same ease of use and performance across many development environments, operating systems, and computer buses.

Integrated Software Framework

Software ties the various pieces of measurement hardware together into a complete measurement system. National Instruments provides an integrated software framework (see Figure 1) to increase development productivity and decrease cost. NI-DAQ is part of the measurement and control services software, which tightly integrates NI measurement hardware with your application development environment. Because NI-DAQ is built in this framework, you can easily integrate and synchronize multiple measurement types, including motion and vision, with your data acquisition system. With this flexible, hardware-independent software, you can achieve interactive configuration, powerful programming, and excellent measurement performance.

Configuration with Measurement & Automation Explorer

Measurement & Automation Explorer simplifies the configuration of your measurement hardware, so you can:

- Quickly detect and configure all hardware
- Use test panels to verify the operation of your hardware (See Figure 4)
- Make simple, interactive measurements
- Name and scale your I/O channels to physical or engineering units (See Figure 3)

Powerful Programming

NI-DAQ software isolates you from hardware-specific register commands and gives you a simple, yet powerful application programming interface (API) between the complete hardware capabilities and a wide variety of development environments and languages. Because of the consistent API, you can use different DAQ hardware with the same application without modifying your software.

High-Performance Measurements

NI-DAQ is optimized for measurement performance and ease of use. NI-DAQ software delivers:

- Efficiency and speed through event-driven programming
- Synchronization of measurements across multiple devices
- Seamless integration of measurement accessories
- Flawless buffer and DMA management

Driver Software for Data Acquisition and Signal Conditioning

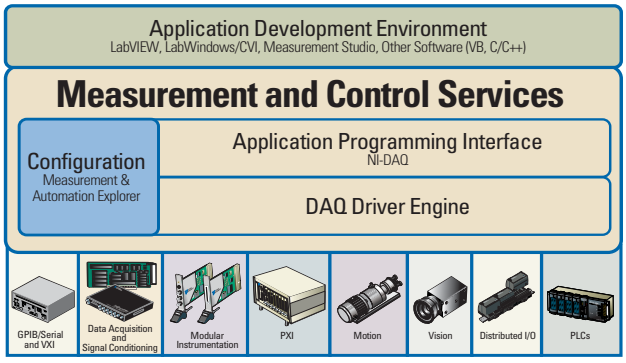


Figure 1. Integrated Software Framework

LabVIEW and NI-DAQ

Using NI-DAQ, you can easily acquire, analyze, and present your measurements in LabVIEW. Figure 4 shows the block diagram of a typical data acquisition in LabVIEW. With the first set of NI-DAQ VIs, you configure your acquisition and read data from your sensor. Because this VI uses a named channel, most of the signal conditioning and DAQ hardware configuration is handled automatically. Next, you route the waveform from the read VI to the peak detect measurement VI. The waveform data type carries the scaled sensor and time data to the measurement function. Finally, the measurement data can be displayed in an indicator and/or a waveform graph that automatically has the correct time and engineering units.

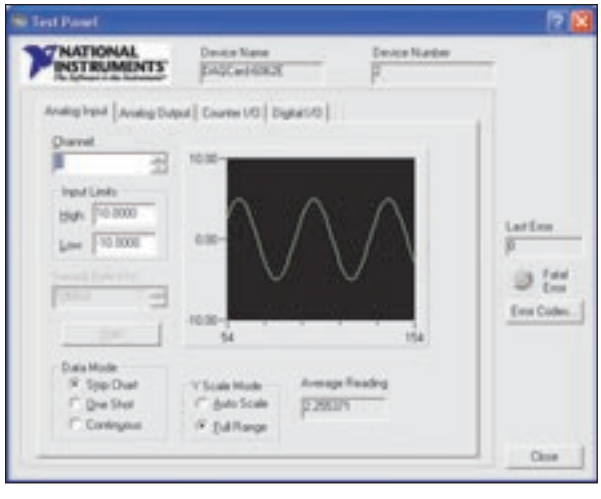


Figure 2. Quickly test your devices with the NI-DAQ test panels.

Measurement Examples

The NI Developer Zone (***ni.com/zone***) has more than 2,400 LabVIEW, C, and Visual Basic source code examples written by NI development and application engineers, system integrators, and customers. These free measurement examples cover basic functional examples such as analog and digital I/O, counter/timer operations, and signal processing and analysis. Plus, you can search on applications ranging from temperature and strain to sound and vibration to machine vision and motion control. With NI's increasing community of virtual instrumentation developers, the number of examples continues to grow quickly.

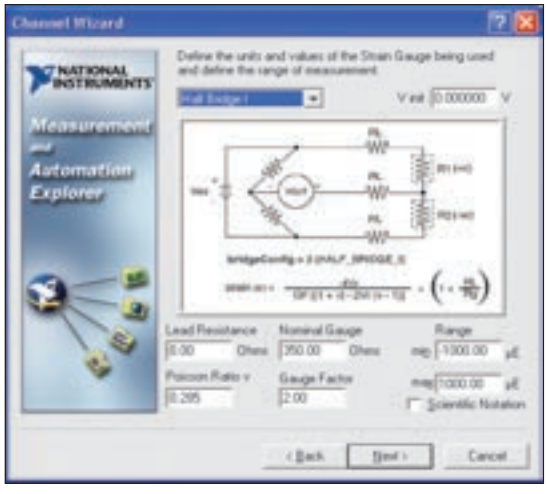


Figure 3. Measurement & Automation Explorer makes naming, scaling, and accessing I/O channels easy.

Other Operating Systems

NI-DAQ is built on proven, industry-standard Windows and Mac OS technologies. If your application requires the use of another operating system, you have several options. For information on an open-source, third-party Linux driver, please visit ***ni.com/linux***. For other OSs, such as WinCE and QNX, please see the Measurement Hardware DDK on the following page.

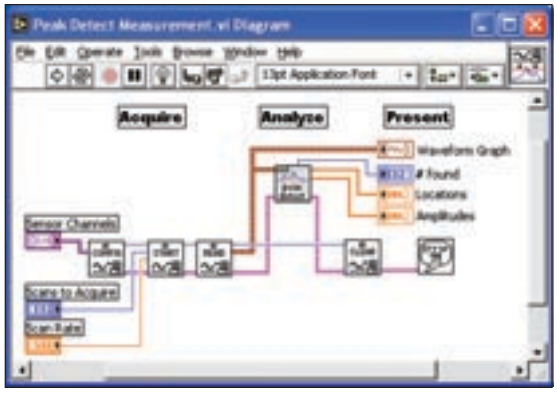


Figure 4. Acquire, analyze, and present with NI-DAQ and LabVIEW.

Multifunction DAQ Cable and Accessory Selection Guides

NI Cable Design Advantages

The SH68-68-EP cable is the most commonly used E Series and S Series cable. The cable is designed to work specifically with the NI Multifunction DAQ devices to preserve signal integrity through these technologies:

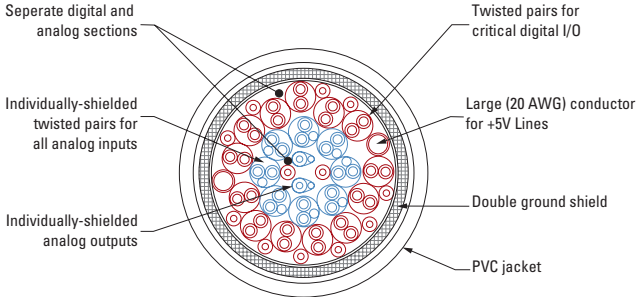
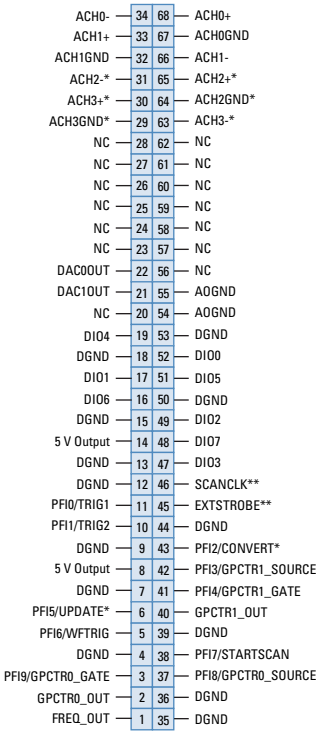

Seperate digital and analog sections
Twisted pairs for critical digital I/O
Individually-shielded twisted pairs for all analog inputs
Large (20 AWG) conductor for +5V Lines
Double ground shield
Individually-shielded analog outputs
PVC jacket

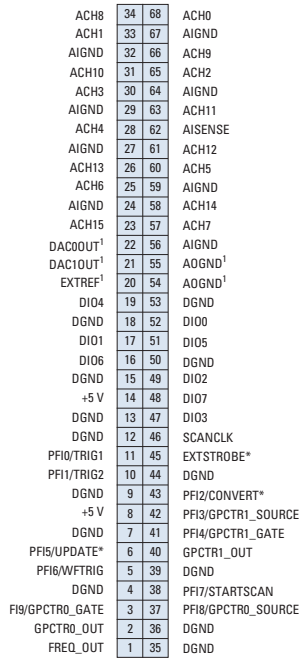
Figure 1. SH68-68-EP Cable

A variety of cabling and accessory options are available for your needs. Use the following tables to choose the most appropriate cables and accessories. To determine which Multifunction DAQ device best fits your needs, please see page 192.


ACH0- 34 68 ACH0+
ACH1+ 33 67 ACH0GND
ACH1GND 32 66 ACH1-
ACH2-* 31 65 ACH2+*
ACH3+* 30 64 ACH2GND*
ACH3GND* 29 63 ACH3-*
NC 28 62 NC
NC 27 61 NC
NC 26 60 NC
NC 25 59 NC
NC 24 58 NC
NC 23 57 NC
DAC0OUT 22 56 NC
DAC1OUT 21 55 AOGND
NC 20 54 AOGND
DIO4 19 53 DGND
DGND 18 52 DIO0
DIO1 17 51 DIO5
DIO6 16 50 DGND
DGND 15 49 DIO2
5 V Output 14 48 DIO7
DGND 13 47 DIO3
DGND 12 46 SCANCLK**
PFI0/TRIG1 11 45 EXTSTROBE**
PFI1/TRIG2 10 44 DGND
DGND 9 43 PFI2/CONVERT*
5 V Output 8 42 PFI3/GPCTR1_SOURCE
DGND 7 41 PFI4/GPCTR1_GATE
PFI5/UPDATE* 6 40 GPCTR1_OUT
PFI6/WFTRIG 5 39 DGND
DGND 4 38 PFI7/STARTSCAN
PFI9/GPCTR0_GATE 3 37 PFI8/GPCTR0_SOURCE
GPCTR0_OUT 2 36 DGND
FREQ_OUT 1 35 DGND

*No connect for NI PCI-6111E
* *Reserved on the NI PCI-6110, NI PCI-6111

Figure 2. S Series Devices Connector


ACH8 34 68 ACH0
ACH1 33 67 AIGND
AIGND 32 66 ACH9
ACH10 31 65 ACH2
ACH3 30 64 AIGND
AIGND 29 63 ACH11
ACH4 28 62 AISENSE
AIGND 27 61 ACH12
ACH13 26 60 ACH5
ACH6 25 59 AIGND
AIGND 24 58 ACH14
ACH15 23 57 ACH7
DAC0OUT[1] 22 56 AIGND
DAC1OUT[1] 21 55 AOGND[1]
EXTREF[1] 20 54 AOGND[1]
DIO4 19 53 DGND
DGND 18 52 DIO0
DIO1 17 51 DIO5
DIO6 16 50 DGND
DGND 15 49 DIO2
+5 V 14 48 DIO7
DGND 13 47 DIO3
DGND 12 46 SCANCLK
PFI0/TRIG1 11 45 EXTSTROBE*
PFI1/TRIG2 10 44 DGND
DGND 9 43 PFI2/CONVERT*
+5 V 8 42 PFI3/GPCTR1_SOURCE
DGND 7 41 PFI4/GPCTR1_GATE
PFI5/UPDATE* 6 40 GPCTR1_OUT
PFI6/WFTRIG 5 39 DGND
DGND 4 38 PFI7/STARTSCAN
PFI9/GPCTR0_GATE 3 37 PFI8/GPCTR0_SOURCE
GPCTR0_OUT 2 36 DGND
FREQ_OUT 1 35 DGND

[1]Not used on NI PCI-6032E, NI PCI-6023, NI PCI-6034E, NI PCI-6013

Figure 3. I/O Connector for 16-channel E Series Devices, except NI 6025E

Platform	Shielding	Connect to ...	Cable	Adapter	Accessory
PCI/PXI/USB/FireWire	Shielded	SCC portable signal conditioning per channel	SH68-68-EP	–	SC-2345 and modules, p. 320
		SCXI high-performance signal conditioning	SCXI-1349	–	SCXI Chassis and Modules, p. 246
		Screw terminals [1]	SH68-68-EP or SH68-68R1-EP	–	SCB-68
		BNC terminal block	SH68-68-EP	–	BNC-2110, BNC-2120, BNC-2090
		50-pin connector	SH6850	–	CB50, custom or 3rd party
		Configurable connectivity box	SH68-68-EP	–	CA-1000
	Unshielded	Screw terminals [1]	R6868	–	TBX-68, CB-68LP, CB-68LPR, DAQ Signal Accessory
		50-pin connector	R6850	–	CB50, custom or 3rd party
PXI only	Shielded	Front-mounted screw terminals	N/A	–	TB-2705
PCMCIA	Shielded	Screw terminals [1]	SHC68-68-EP or SHC68U-68-EP [2]	–	SCB-68, CA-1000
		50-pin connector	SHC68-68-EP or SHC68U-68-EP [2]	68M-50F MIO	CB50, custom or 3rd party
	Unshielded	Screw terminals [1]	RC68-68		TBX-68, CB-68LP, CB-68LPR, DAQ Signal Accessory
		50-pin connector	RC68-68	68M-50F MIO	CB50, custom or 3rd party

ISA - Visit ni.com/info and enter in "legacy" for more information on ISA products
[1] Unshielded Cables can connect to Shielded Accessories and vice-versa.
[2] In adjacent PCMCIA slots, both cables types are required because the same cable would cause mechanical hindrance.

Table 1. Cable Connection Specifications for 16-Channel E Series Devices (except NI 6025E)

Multifunction DAQ Cable and Accessory Selection Guides

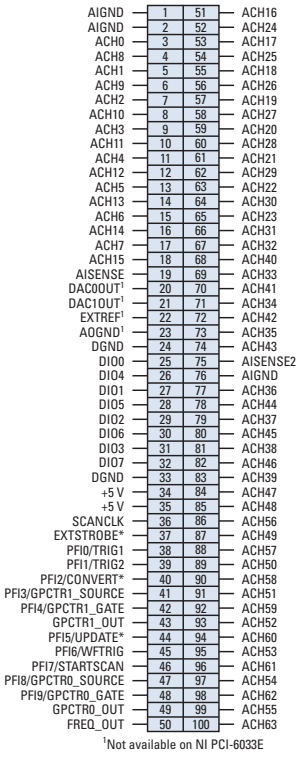

AIGND 1 51 ACH16
AIGND 2 52 ACH24
ACH0 3 53 ACH17
ACH8 4 54 ACH25
ACH1 5 55 ACH18
ACH9 6 56 ACH26
ACH2 7 57 ACH19
ACH10 8 58 ACH27
ACH3 9 59 ACH20
ACH11 10 60 ACH28
ACH4 11 61 ACH21
ACH12 12 62 ACH29
ACH5 13 63 ACH22
ACH13 14 64 ACH30
ACH6 15 65 ACH23
ACH14 16 66 ACH31
ACH7 17 67 ACH32
ACH15 18 68 ACH40
AISENSE 19 69 ACH33
DAC0OUT[1] 20 70 ACH41
DAC1OUT[1] 21 71 ACH34
EXTREF[1] 22 72 ACH42
AOGND[1] 23 73 ACH35
DGND 24 74 ACH43
DIO0 25 75 AISENSE2
DIO4 26 76 AIGND
DIO1 27 77 ACH36
DIO5 28 78 ACH44
DIO2 29 79 ACH37
DIO6 30 80 ACH45
DIO3 31 81 ACH38
DIO7 32 82 ACH46
DGND 33 83 ACH39
+5 V 34 84 ACH47
+5 V 35 85 ACH48
SCANCLK 36 86 ACH56
EXTSTROBE* 37 87 ACH49
PFI0/TRIG1 38 88 ACH57
PFI1/TRIG2 39 89 ACH50
PFI2/CONVERT* 40 90 ACH58
PFI3/GPCTR1_SOURCE 41 91 ACH51
PFI4/GPCTR1_GATE 42 92 ACH59
GPCTR1_OUT 43 93 ACH52
PFI5/UPDATE* 44 94 ACH60
PFI6/WFTRIG 45 95 ACH53
PFI7/STARTSCAN 46 96 ACH61
PFI8/GPCTR0_SOURCE 47 97 ACH54
PFI9/GPCTR0_GATE 48 98 ACH62
GPCTR0_OUT 49 99 ACH55
FREQ_OUT 50 100 ACH63
[1]Not available on NI PCI-6033E

Figure 4. I/O Connector for 64-channel NI devices

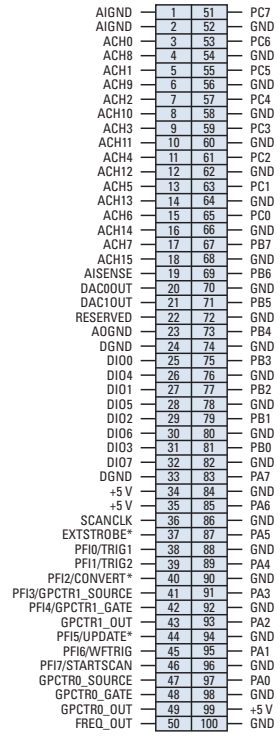

AIGND 1 51 PC7
AIGND 2 52 GND
ACH0 3 53 PC6
ACH8 4 54 GND
ACH1 5 55 PC5
ACH9 6 56 GND
ACH2 7 57 PC4
ACH10 8 58 GND
ACH3 9 59 PC3
ACH11 10 60 GND
ACH4 11 61 PC2
ACH12 12 62 GND
ACH5 13 63 PC1
ACH13 14 64 GND
ACH6 15 65 PC0
ACH14 16 66 GND
ACH7 17 67 PB7
ACH15 18 68 GND
AISENSE 19 69 PB6
DAC0OUT 20 70 GND
DAC1OUT 21 71 PB5
RESERVED 22 72 GND
AOGND 23 73 PB4
DGND 24 74 GND
DIO0 25 75 PB3
DIO4 26 76 GND
DIO1 27 77 PB2
DIO5 28 78 GND
DIO2 29 79 PB1
DIO6 30 80 GND
DIO3 31 81 PB0
DIO7 32 82 GND
DGND 33 83 PA7
+5 V 34 84 GND
+5 V 35 85 PA6
SCANCLK 36 86 GND
EXTSTROBE* 37 87 PA5
PFI0/TRIG1 38 88 GND
PFI1/TRIG2 39 89 PA4
PFI2/CONVERT* 40 90 GND
PFI3/GPCTR1_SOURCE 41 91 PA3
PFI4/GPCTR1_GATE 42 92 GND
GPCTR1_OUT 43 93 PA2
PFI5/UPDATE* 44 94 GND
PFI6/WFTRIG 45 95 PA1
PFI7/STARTSCAN 46 96 GND
GPCTR0_SOURCE 47 97 PA0
GPCTR0_GATE 48 98 GND
GPCTR0_OUT 49 99 +5 V
FREQ_OUT 50 100 GND

Figure 5. I/O Connector for the NI 6025E device

E Series Devices (NI 6031E, NI 6033E, NI 6071E, NI 6025E)

Platform	Shielding	Connect to ...	Cable	Cable Leg	Adapter	Accessory
PCI, PXI	Shielded	Screw Terminals	SH100100	–	–	SCB-100
		Screw Terminals	SH1006868	MIO:	–	SCB-68
				Extended:	–	SCB-68
		Screw Terminals[1]	SH1006868	MIO:	–	TBX-68, CB-68LP, CB-68LPR, DAQ Signal Accessory
				Extended:	–	TBX-68, CB-68LP, CB-68LPR
		BNC Terminal Block	SH1006868	MIO:	–	BNC-2110, BNC-2120, BNC-2090
				Extended:	–	BNC-2115
		50-pin Connectors	SH1006868	MIO:	68M-50F MIO	custom or 3rd party
				Extended:	68M-50F Extended	custom or 3rd party
	Unshielded	50-pin Connector	R1005050	MIO:	–	custom or 3rd party
				Extended:	–	custom or 3rd party

ISA - Visit ni.com/info and enter in "legacy" for more information on ISA Products.
[1]Shielded cable with unshielded accessories

Table 1. Cable Connection Specifications for 64-Channel E Series Devices and the NI 6025E

Multifunction DAQ Accessories

SCXI High-Performance Modular Signal Conditioning (see Figure 1)

SCXI is a high-performance modular signal conditioning platform that you use as a front end to your E Series DAQ device. With the SCXI multiplexing architecture, you can expand your analog inputs to 3,072 channels. Additionally, SCXI offers a variety of modules for connecting to thermocouples, RTDs, strain gauge transducers, LVDT position sensors, ICP-compatible accelerometers/microphones, thermistors, millivolt inputs, voltage inputs up to 1000 V, current inputs (0-20mA), frequency inputs or dynamic signals.

Figure 1. SCXI High-Performance Signal Conditioning

See page 246 for details on SCXI Signal Conditioning.

SCC Portable Modular Signal Conditioning for Low-Channel-Count Applications (see Figure 2)

The SCC Series portable modular signal conditioning system consists of SCC modules that plug into a low-profile SC-2345 shielded carrier. SCC modules give you single or dual-channel signal conditioning for up to 16 analog input channels and eight digital I/O lines of your E Series or basic multifunction DAQ device. The SCC Series offers signal conditioning for a variety of inputs, including thermocouples, RTDs, strain gauges, ICP-compatible accelerometers, accelerators, analog inputs requiring isolation, high voltage (up to 100 V), current (0-20mA), and optically isolated digital I/O. Lowpass filtering and breadboard modules are also available.

Figure 2. SCC Portable, Modular Signal Conditioning

See page 320 for details on SCC Signal Conditioning.

Connector Blocks

BNC-2100 Series Connector Blocks (see Figure 3)

The BNC-2100 Series are shielded connector blocks with signal-labeled BNC connectors for easy connectivity of your analog input, analog output, digital I/O and counter/timer signals to your multifunction DAQ device, including analog input devices. The BNC-2110 and BNC-2120 work with all E Series devices. The BNC-2120 also provides a function generator, quadrature encoder, temperature reference, thermocouple connector, and LED so that you can test the functionality of your hardware. The BNC-2115 has 24 BNC inputs for connecting to the extended I/O channels of our 100-pin E Series DAQ devices.

BNC-2110.....777643-01
Dimensions – 20.3 by 11.2 by 5.5 cm (8.0 by 4.4 by 2.2 in.)

BNC-2115.....777807-01
Dimensions – 20.3 by 11.2 by 5.5 cm (8.0 by 4.4 by 2.2 in.)

BNC-2120.....777960-01
Dimensions – 26.7 by 11.2 by 6.0 cm (10.5 by 4.4 by 2.4 in.)

Figure 3. BNC-2100 Series Connector Blocks – BNC-2120, BNC-2110, BNC-2115

SC-2075 Breadboard Connector Block (see Figure 4)

The SC-2075 provides breadboard area for prototyping and BNC and spring terminal connectivity for 68-pin E Series DAQ devices. The built-in ±15 V or adjustable 0 to 5 V power supply and LEDs for digital lines make the SC-2075 a cost-effective device, ideal for academic laboratories.

SC-2075 778147-90
Dimensions – 26.72 by 20.70 by 4.37 cm (10.52 by 8.15 by 1.72 in.)

Figure 4. SC-2075 Breadboard Connector Block

Multifunction DAQ Accessories

Figure 5. BNC-2090 Shielded BNC Adapter Chassis

BNC-2090 Shielded BNC Adapter Chassis (see Figure 5)

The BNC-2090 is a shielded, rack-mountable adapter with signal-labeled BNC connectors, spring terminal blocks, and component locations for passive signal conditioning. Consists of 22 BNC connectors and 28 spring terminals to simplify connection to your analog, digital, trigger and counter/timer signals. The BNC-2090 has silk-screened component locations that you use to develop simple signal conditioning circuits. For added flexibility, you can connect any E Series DAQ device to the BNC-2090 from the front or rear through dual 68-pin connectors.

BNC-2090 777270-01

Dimensions – 48.3 by 4.4 by 18.8 cm (19.0 by 1.7 by 7.4 in.)

Figure 6. CA-1000 Configurable Signal Conditioning Enclosure

CA-1000 Configurable Signal Conditioning Enclosure (see Figure 6)

The CA-1000 is a configurable enclosure that gives you maximum user-defined connectivity and flexibility through customized panelettes. Each enclosure can accommodate up to nine panelettes.

Dimensions – 30.7 by 25.4 by 4.3 cm (21.1 by 10 by 1.7 in.)

See page 352 for more information about the CA-1000.

Figure 7. TB-2705 Terminal Block

TB-2705 Terminal Block for 68-pin PXI E Series Devices (see Figure 7)

The TB-2705 is a screw terminal block for PXI that works with your PXI E Series DAQ module. It latches to the front of your PXI module with locking screws and provides strain relief and easy access to your analog, digital, trigger and counter/timer signals through screw terminals.

TB-2705 778241-01

Dimensions – 8.43 by 10.41 by 2.03 cm (3.32 by 4.1 by 0.8 in.)

Figure 8. SCB-68 and SCB-100 Shielded I/O Connector Blocks

SCB-68 and SCB-100 Shielded I/O Connector Blocks (see Figure 8)

The SCB-68 and SCB-100 are shielded I/O connector blocks for rugged, very low-noise signal termination for connecting to 68-pin or 100-pin E Series DAQ devices, respectively. Silk-screened component locations for easy addition of simple signal-conditioning circuitry for your analog input channels. They also include general-purpose breadboard areas (two on the SCB-68; three on the SCB-100) as well as an IC temperature sensor for cold-junction compensation in temperature measurements.

SCB-68 776844-01

Dimensions – 19.5 by 15.2 by 4.5 cm (7.7 by 6.0 by 1.8 in.)

SCB-100 776990-01

Dimensions – 19.5 by 15.2 by 4.5 cm (7.7 by 6.0 by 1.8 in.)

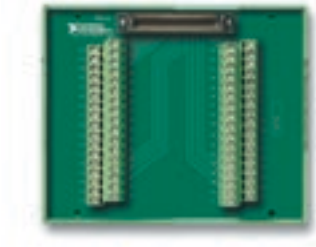


Figure 9. TBX-68 I/O Connector Block

TBX-68 I/O Connector Block with DIN-Rail Mounting (see Figure 9)

The TBX-68 is a termination accessory with 68 screw terminals for easy connection of field I/O signals to 68-pin DAQ devices. It includes one 68-pin male connector for direct connection to 68-pin cables. The TBX-68 is mounted in a protective plastic base with hardware for mounting on a standard DIN rail.

TBX-68 777141-01

Dimensions – 12.50 by 10.74 cm (4.92 by 4.23 in.)

Multifunction DAQ Accessories

CB-68LP and CB-68LPR I/O Connector Blocks (see Figure 10)

The CB-68LP and CB-68LPR are low-cost termination accessories with 68 screw terminals for easy connection of field I/O signals to 68-pin E Series DAQ devices. They include one 68-pin male connector for direct connection to 68-pin cables. The connector blocks include standoffs for use on a desktop or for mounting in a custom panel. The CB-68LP has a vertical-mounted 68-pin connector. The CB-68LPR has a right-angle mounted connector, and it is used with the CA-1000 (see page 352).

CB-68LP 777145-01
Dimensions – 14.35 by 10.74 cm (5.65 by 4.23 in.)
CB-68LPR 777145-02
Dimensions – 7.62 by 16.19 cm (3.00 by 6.36 in.)

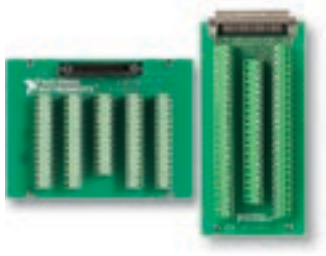


Figure 10. CB-68LP and CB-68LPR I/O Connector Blocks

DAQ Signal Accessory (see Figure 11)

The DAQ Signal Accessory demonstrates and tests the use of analog, digital, and counter/timer functions of DAQ devices. You can connect the DAQ Signal Accessory directly to your DAQ device. It features a built-in function generator, quadrature encoder, solid-state relay, IC temperature sensor, noise generator, microphone jack, thermocouple jack, four LEDs, and a digital trigger button. The DAQ Signal Accessory works with all E Series DAQ devices.

DAQ Signal Accessory 777382-01
Dimensions – 12.7 by 12.7 cm (5.0 by 5.0 in.)

Figure 11. DAQ Signal Accessory

RTSI Bus Cables (see Figure 12)

Use RTSI bus cables to connect timing and synchronization signals among Measurement, Vision, Motion, and CAN boards for PCI, and FireWire DAQPad devices. For systems using long and short boards, order the extended RTSI cable.

2 boards 776249-02
3 boards 776249-03
4 boards 776249-04
5 boards 776249-05
Extended, 5 boards 777562-05
3 FireWire DAQPads 186464-01

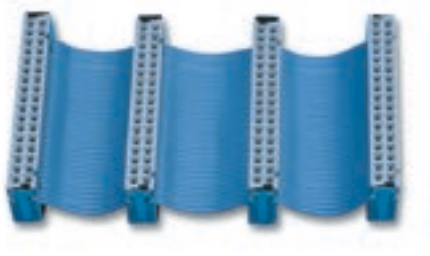


Figure 12. RTSI Bus Cable

Shielded I/O Cables

SH68-68-EP Shielded Cable (see Figure 13)

The SH68-68-EP is a shielded 68-conductor cable terminated with two 68-pin female 0.050 series D-type connectors. It features individually-shielded analog twisted pairs for reduced crosstalk with high-speed devices. This cable connects to all 68-pin E Series devices (except DAQCards). If you need a right-angle connector, the SH68-68R1-EP shielded cable is electrically equivalent.

1 m.....184749-01
2 m.....184749-02
Please call for other length options.

Figure 13. SH68-68-EP Shielded Cable

SH68-68R1-EP Shielded Cable (see Figure 14)

The SH68-68R1-EP is a shielded 68-conductor cable. One end terminates with a 68-pin female 0.050 series D-type connector and the other end terminates with a right-angle 68-pin female 0.050 series D-type connector.

1 m.....187051-01

Figure 14. SH68-68R1-EP Shielded Cable

Multifunction DAQ Accessories

Figure 15. SH100100 Shielded Cable

Figure 16. 68M-50F Cable Adapters

Figure 17. SH1006868 Shielded Cable

Figure 18. SHC68-68-EP and SHC68U-68-EP Shielded Cables

Figure 19. SH6850 Shielded Cable

SH100100 Shielded Cable (see Figure 15)

The SH100100 is a shielded 100-conductor cable terminated with 100-pin male 0.050 series D-type connectors. This cable connects the 100-pin E Series devices to 100-pin accessories.

1 m.....182853-01
2 m.....182853-02

68M-50F S Series Cable Adapters (see Figure 16)

The 68M-50F cable adapter connects a 68-pin NI cable to a standard 0.1 by 0.1 in. 50-pin connector on third-party or custom accessories. The 68M-50F MIO should be used with the SH68-68-EP, SHC68-68-EP, SHC68U-68-EP, or the MIO leg of the SH1006868. The 68M-50F Extended I/O cable adapter should be used for the extended I/O leg of the SH1006868.

68M-50F MIO 184670-01
68M-50F Extended I/O 184670-02

SH1006868 Shielded Cable (see Figure 17)

The SH1006868 is a shielded cable that connects to 100-pin E Series devices and terminates with two female 68-pin 0.050 series D-type connectors. See Table 2 on page 256 for accessories compatible with each 68-pin connector.

1 m 182849-01
2 m 182849-02

SHC68-68-EP and SHC68U-68-EP Shielded Cables for DAQCards (see Figure 18)

These cables connect DAQCards to standard 68-pin accessories. Latching screws secure the shielded connector to the PCMCIA DAQCard. The SHC68-68-EP is a shielded 68-conductor cable terminated with a VHDCI 68-pin male connector at one end and a 68-pin female 0.050 series D-type connector at the other. The SHC68U-68-EP is identical to the SHC68-68-EP except it uses an inverted VHDCI 68-pin male connector. Use the SHC68-68-EP cable with a DAQCard inserted in the lower PCMCIA slot in your laptop or when using only one DAQCard. Use the SH68U-68-EP for a DAQCard located in the upper PCMCIA slot in your laptop. When using two E Series DAQCard PCMCIA devices in adjacent slots, use one SHC68-68-EP and one SHC68U-68-EP.

SHC68-68-EP
0.5 m 186838-0R5
1 m 186838-01
SHC68U-68-EP
0.5 m 187406-0R5
1 m 187406-01

SH6850 Shielded Cable (see Figure 19)

The SH6850 connects a standard 68-pin E Series or S Series product to a 3rd party or custom standard 50-pin accessory. The cable provides a screw-latching 68-pin female connector on one side and a standard 50-pin female connector on the other side.

1 m 776784-01
2 m 776784-02

Multifunction DAQ Accessories

Ribbon I/O Cables

R6868 Ribbon Cable for E Series Devices (see Figure 20)

The R6868 is a 68-conductor flat ribbon cable terminated with two 68-pin connectors. Use this cable to connect a 68-pin E Series device to 68-pin accessories.

1 m 182482-01

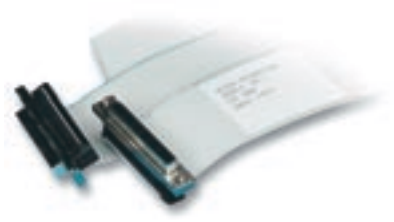


Figure 20. R6868 Ribbon Cable

RC68-68 Ribbon Cable for DAQCards (see Figure 21)

The RC68-68 ribbon cable connects DAQCards directly to 68-pin accessories. Two RC68-68 cables can be used together in adjacent PCMCIA slots.

0.25 m 187252-0R25

1 m 187252-01

Figure 21. RC68-68 Ribbon Cable

R1005050 Ribbon Cable (see Figure 22)

This cable connects 100-pin E Series devices, including the NI 6071E, NI 6033E, NI 6031E, and NI 6025E to standard 50-pin 3rd party or custom connectors.

1 m 182762-01

2 m 182762-02

Figure 22. R1005050 Ribbon Cable

R6850 Ribbon Cable Kit (see Figure 23)

This cable kit combines a 68F-50M cable adapter and a standard 50-pin cable with female connectors on both ends. The cable kit is designed to adapt an E Series, S Series, or PCI-6013/6014 product to a third-party or custom 50-pin accessory.

1 m 776842-01

Figure 23. R6850 Ribbon Cable Kit

Custom Connectivity Components

68-Pin Custom Cable Connector/Backshell Kit (see Figure 24)

The 68-pin female mating connector and backshell kit is used to make custom cables. Solder-cup contacts are available for soldering cable wires to the connector.

68-pin connector/backshell kit 776832-01

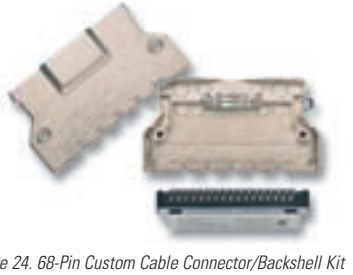


Figure 24. 68-Pin Custom Cable Connector/Backshell Kit

Multifunction DAQ Accessories

Figure 25. PCB Mounting Connectors for Custom Accessories

PCB Mounting Connectors for Custom Accessories (see Figure 25)

PCB mounting connectors are used to build custom accessories that connect to 68-conductor or 100-conductor shielded and ribbon cables. Two connectors are available, one for right-angle and one for vertical mounting onto a PCB.

68-pin, male, right-angle mounting 777600-01
68-pin, male, vertical mounting 777601-01
100-pin, female, right-angle mounting.....777778-01
100-pin, female, vertical mounting 777779-01

Figure 26. PCMCIA Strain-Relief Accessory

PCMCIA Strain-Relief Accessory (see Figure 26)

The PCMCIA Strain-Relief accessory attaches to the bottom of your notebook computer and provides adjustable strain relief for one or two PCMCIA cables attached to the installed PCMCIA card(s).

PCMCIA Strain-Relief Accessory 777550-01

Figure 28. Use the interactive configuration tool in the NI online catalog to select and purchase multifunction DAQ solutions.

Use Interactive Online Catalog Configurator for Quick Product Selection

You can now easily configure NI multifunction data acquisition (DAQ) measurement systems using a new, interactive feature of our online catalog. The interactive online catalog offers a better, easier way to select and purchase measurement solutions from National Instruments. Based on user imput, the interactive online catalog suggests products and then lists the appropriate cables and accessories for those products. This new automated tool helps eliminate ordering mistakes and product-compatibility errors.

To take advantage of the online catalog for multifunction DAQ devices, visit ***ni.com/catalog***

From the Products and Services menu, select Data Acquisition, then select Multifunction I/O. The online catalog prompts you with a series of questions regarding preferences for operating system, computer bus, number of channels, and maximum sampling rate. The online catalog then recommends several appropriate DAQ devices. You can then review specifications for each device and select your preferred product. Next, the catalog suggests the preferred accessory and cable solution designed to work with the selected DAQ device. You have the option of choosing the preferred configuration or choosing from a separate list of accessories and cables that also work with the selected DAQ device. You can purchase the selected items online.

16-Bit E Series Multifunction DAQ Specifications

Specifications – NI 6052E and NI 603xE

These specifications are typical for 25 °C unless otherwise noted.

Analog Input

Accuracy specifications ..... See tables in E Series product pages.

Input Characteristics

Number of channels

6052E 6030E 6032E 6034E 6036E	16 single-ended or 8 differential (software selectable per channel)
6031E 6033E	64 single-ended or 32 differential (software-selectable per channel)

Resolution ..... 16 bits, 1 in 65,536

Maximum sampling rate

6052E	333 kS/s
6034E 6036E	200 kS/s
6030E 6031E 6032E 6033E	100 kS/s

Streaming-to-disk rate (system dependent)[1]

6052E	333 kS/s
6034E 6036E	200 kS/s
6030E 6031E 6032E 6033E	100 kS/s

[1]Streaming-to-disk rates do not apply to RT Series devices.

Input signal ranges

Device	Range Software Selectable	Bipolar Input Range	Unipolar Input Range
6052E	20 V	±10 V	–
	10 V	±5 V	0 to 10 V
	5 V	±2.5 V	0 to 5 V
	2 V	±1 V	0 to 2 V
	1 V	±500 mV	0 to 1 V
	500 mV	±250 mV	0 to 500 mV
	200 mV	±100 mV	0 to 200 mV
	100 mV	±50 mV	0 to 100 mV
6030E	20 V	±10 V	–
6031E	10 V	±5 V	0 to 10 V
6032E	5 V	–	0 to 5 V
6033E	4 V	±2 V	–
	2 V	±1 V	0 to 2 V
	1 V	±500 mV	0 to 1 V
	500 mV	–	0 to 500 mV
	400 mV	±200 mV	–
	200 mV	±100 mV	0 to 200 mV
	100 mV	–	0 to 100 mV
6034E	20 V	±10 V	–
6036E	10 V	±5 V	–
	1 V	±500 mV	–
	100 mV	±50 mV	–

Input coupling ..... DC

Maximum working voltage
(signal + common mode) ..... Each input should remain within ±11 V of ground

Overvoltage protection
Powered on ..... ±25 V
Powered off ..... ±15 V

Inputs protected

6052E 6030E 6032E 6034E 6036E	ACH<0..15>, AISENSE
6031E 6033E	ACH<0..63>, AISENSE, AISENSE2

FIFO buffer size ..... 512 samples, (1024 samples for DAQCard

Data transfers
PCI, PXI ..... DMA, interrupts, programmed I/O
DAQCard ..... Interrupts, programmed I/O

DMA modes
PCI, PXI ..... Scatter-gather (single transfer, demand transfer)

Configuration memory size ..... 512 words

Transfer Characteristics

Relative accuracy (dithered)

Device	Typical	Maximum
6052E 6034E PCI-6036E	±1.5 LSB	±3 LSB
6030E 6031E 6032E 6033E	±0.75 LSB	±1 LSB
DAQCard-6036E	±3.0 LSB	±6 LSB

DNL

Device	Typical	Maximum
6052E 603xE (except DAQCard-6036E)	±0.5 LSB	±1 LSB
DAQCard-6036E	+4, -0.5 LSB	+4, -2 LSB

No missing codes ..... 16 bits, guaranteed

Amplifier Characteristics

Input impedance

Device	Normal Powered On	Powered Off	Overload
6052E 603xE	100 GΩ in parallel with 100 pF	820 Ω	820 Ω

Input bias and offset current

Device	Bias Current	Offset Current
6052E 6034E PCI-6036E	±200 pA	±100 pA
6030E 6031E 6032E 6033E	±1 nA	±2 nA
DAQCard-6036E	±200 pA	±100 pA

Specifications – NI 6052E and NI 603xE (continued)

CMRR, DC to 60 Hz

Device	Range	CMRR	
		Bipolar (dB)	Unipolar (dB)
6052E	20 V	92	–
	10 V	97	97
	5 V	101	101
	2 V	104	104
	100 mV to 1 V	105	105
6030E	20 V	92	–
6031E	10 V	97	92
6032E	5 V	–	97
6033E	4 V	101	–
	2 V	104	101
	1 V	105	104
	100 mV to 500 mV	105	105
6034E	20 V	85	–
6036E	10 V	85	–
	1 V	96	–
	100 mV	96	–

Dynamic Characteristics

Bandwidth

Device	Range	Small Signal (-3 dB)
6052E	All ranges	480 kHz
6030E 6031E 6032E 6033E	All ranges	255 kHz
6034E 6036E	All ranges	413 kHz

System noise (LSB_{rms}, including quantization)

Device	Range	Bipolar	Unipolar
6052E	2 to 20 V	0.95	0.95
	1 V	1.1	1.1
	500 mV	1.3	1.3
	200 mV	2.7	2.7
	100 mV	5.0	5.0
6030E	2 to 20 V	0.6	0.8
6031E	1 V	0.7	0.8
6032E	400 to 500 mV	1.1	1.1
6033E	200 mV	2.0	2.0
	100 mV	–	3.8
6034E	10 to 20 V	0.8	–
6036E	1 V	1.0	–
	100 mV	6.2	–

Settling time to full-scale step

Device	Range	Accuracy				
		±0.00076% (±0.5 LSB)	±0.0015% (±1 LSB)	±0.0031% (±2 LSB)	±0.0061% (±4 LSB)	±0.024% (±6 LSB)
6052E	2 to 20 V	–	10 µs max	5 µs max	4 µs max	3 µs max
	1 V	–	15 µs max	5 µs max	4 µs max	3 µs max
	200 to 500 mV	–	15 µs max	10 µs max	4 µs max	3 µs max
	100 mV	–	15 µs typical	10 µs typical	4 µs max	3 µs max
6030E 6032E	All	40 µs max	20 µs max	–	10 µs max	–
6031E 6033E	All	50 µs max	25 µs max	–	10 µs max	–
6034E	1 to 10 V	–	–	5 µs max	–	–
6036E	200 mV	–	–	–	5 µs typical	–

Crosstalk

Device	Adjacent Channels	All Other Channels
6052E 603xE	-75 dB	-90 dB

Analog Output

Output Characteristics

Number of channels

6052E 6030E 6031E 6036E 6032E	2 voltage outputs
6033E 6034E	None

Resolution

6052E 6036E 6030E 6031E	16 bits, 1 in 65,536

Maximum update rate

6052E	333 kS/s
6036E	10 kS/s, system dependent
6030E 6031E	100 kS/s

Type of DAC..... Double buffered, multiplying

FIFO buffer size

6052E 6030E 6031E	2,048 samples
6036E	None

Data transfers

PCI, PXI ..... DMA, interrupts, programmed I/O

DAQCard ..... Interrupts, programmed I/O

DMA modes

PCI, PXI ..... Scatter-gather (single transfer, demand transfer)

Transfer Characteristics

Relative accuracy

6052E	±0.35 LSB typical, ±1 LSB max
6030E 6031E	±0.5 LSB typical, ±1 LSB max
6036E	±2 LSB max

DNL..... ±1.0 LSB max

Monotonicity

6052E 6036E 6030E 6031E	16 bits, guaranteed

Voltage Output

Ranges

6052E	±10 V, 0 to 10 V, ±EXTREF, 0 to EXTREF; software selectable
6030E 6031E	±10 V, 0 to 10 V; software selectable
6036E	±10 V

Output coupling ..... DC

Output impedance ..... 0.1 Ω max

Current drive ..... ±5 mA max

Protection..... Short-circuit to ground

Power-on state

6052E 6030E 6031E	0 V (±20 mV)
PCI-6036E	0 V (±44 mV)
DAQCard-6036E	0 V (±60 mV)

16-Bit E Series Multifunction DAQ Specifications

Specifications – NI 6052E and NI 603xE (continued)

External reference input (6052E only)
- Range ..... ±11 V
- Overvoltage protection ..... ±25 V powered on, ±15 V powered off
- Input impedance ..... 10 kΩ
- Bandwidth (-3 dB) ..... 3 kHz
- Slew rate ..... 0.3 V/µs

Dynamic Characteristics

Settling time and slew rate

Device	Settling Time for Full-Scale Step	Slew Rate
6052E	3.5 µs to ±1 LSB accuracy	15 V/µs
6030E 6031E	10 µs to ±1 LSB accuracy	5 V/µs
PCI-6036E	10 µs to ±4.0 LSB accuracy	15 V/µs
DAQCard-6036E	10 µs to ±0.5 LSB	5 V/µs

Noise

6052E 6030E 6031E	60 μV_{rms}, DC to 1 MHz
PCI-6036E	110 μV_{rms}, DC to 400 kHz
DAQCard-6036E	160 μV_{rms}, DC to 400 kHz

Glitch energy (at mid-scale transition)

Device	Magnitude	Duration
6052E	±10 mV	1 µs
6030E 6031E	N/A	N/A
PCI-6036E	±10 mV	1 µs

Digital I/O

- Number of channels ..... 8 input/output
- Compatibility ..... 5 V/TTL/CMOS
- Power-on state ..... Input (high impedance)
- Data transfers ..... Programmed I/O

Digital logic levels

Level	Minimum	Maximum
Input low voltage	0 V	0.8 V
Input high voltage	2 V	5 V
Output low voltage (Iout = 24 mA)	–	0.4 V
Output high voltage (Iout = 13 mA)	4.35 V	–

Timing I/O

General-Purpose Up/Down Counter/Timers

- Number of channels 2
- Resolution ..... 24 bits (1 in 16, 777, 216)
- Compatibility ..... 5 V/TTL/CMOS

Digital logic levels

Level	Minimum	Max
Input low voltage	0.0 V	0.8 V
Input high voltage	2.0 V	5.0 V
Output low voltage (Iout = 5 mA)	–	0.4 V
Output high voltage (Iout = 3.5 mA)	4.35 V	–

- Base clocks available ..... 20 MHz and 100 kHz
- Base clock accuracy ..... ±0.01%
- Maximum source frequency ..... 20 MHz
- External source selections ..... PFI <0..9>, RTSI <0..6>, analog trigger; software selectable
- External gate selections ..... PFI <0..9>, RTSI <0..6>, analog trigger; software selectable
- Minimum source pulse duration ..... 10 ns
- Minimum gate pulse duration ..... 10 ns, edge-detect mode
- Data transfers
  - PCI, PXI ..... DMA, interrupts, programmed I/O
  - DAQCard ..... Interrupts, programmed I/O
- DMA modes
  - PCI, PXI ..... Scatter-gather (single transfer, demand transfer)

Frequency Scaler

- Number of channels 1
- Resolution ..... 4 bits
- Compatibility ..... 5 V/TTL
- Digital logic levels

Level	Minimum	Max
Input low voltage	0.0 V	0.8 V
Input high voltage	2.0 V	5.0 V
Output low voltage (Iout = 5 mA)	–	0.4 V
Output high voltage (Iout = 3.5 mA)	4.35 V	–

- Base clocks available ..... 10 MHz, 100 kHz
- Base clock accuracy ..... ±0.01%
- Data transfers ..... Programmed I/O

Triggers

Analog Triggers

Number of triggers

6052E 6030E 6031E 6032E 6033E	1
6034E 6036E	None

Purpose
- Analog input ..... Start and stop trigger, gate, clock
- Analog output ..... Start trigger, gate, clock
- General-purpose counter/timers ..... Source, gate

Source

6052E 6030E 6032E	ACH<0..15>, PF10/TRIG1
6031E 6033E	ACH<0..63>, PF10/TRIG1

Level
- Internal source, ACH<0..15/63> ..... ±Full-scale
- External source, PFI0/TRIG1 ..... ±10 V

- Slope ..... Positive or negative; software-selectable
- Resolution ..... 12 bits, 1 in 4,096
- Hysteresis ..... Programmable
- Bandwidth (-3 dB)

Device	Internal Source ACH<0..15/63>	External Source PFI0/TRIG1
6052E	700 kHz	700 kHz
6030E, 6031E, 6032E, 6033E	255 kHz	4 MHz

- Accuracy ..... ±1% of full-scale range max

Digital Triggers (all devices)

- Number of triggers 2

Purpose
- Analog input ..... Start and stop trigger, gate, clock
- Analog output ..... Start trigger, gate, clock
- General-purpose counter/timers ..... Source, gate

- Source ..... PFI <0..9>, RTSI <0..6>
- Slope ..... Positive or negative; software selectable
- Compatibility ..... 5 V/TTL
- Response ..... Rising or falling edge
- Pulse width ..... 10 ns minimum

Specifications – NI 6052E and NI 603xE (continued)

External Input for Digital or Analog Trigger (PFI0/TRIG1)
Impedance ..... 10 kΩ
Coupling ..... DC
Protection
Digital trigger ..... -0.5 to (Vcc + 0.5) V
Analog trigger
On/Off/Disabled ..... ±35 V

Calibration

Recommended warm-up time ..... 15 minutes; 30 minutes for DAQCard
Calibration Interval ..... 1 year
Onboard calibration reference
DC Level

6052E 6030E 6031E 6032E 6033E	5.000 V (±1.0 mV)	Over full operating temperature, actual value stored in EEPROM
6034E 6036E	5.000 V (±3.5 mV)	

Temperature coefficient

6052E 6030E 6031E 6032E 6033E	±0.6 ppm/°C max
6012E 6034E 6036E	±5.0 ppm/°C max

Long-term stability

6052E 6030E 6031E 6032E 6033E	±6.0 ppm/$\sqrt{1000\ h}$
6034E 6036E	±15.0 ppm/$\sqrt{1000\ h}$

RTSI (PCI only)

Trigger lines 7

PXI Trigger Bus (PXI only)

Trigger lines 6
Star Trigger 1

Bus Interface

PCI, PXI ..... Master, slave
DAQCard ..... Slave

Power Requirements[1]

Device	+5 VDC (±5%)	Power Available at I/O Connector
6052E	1.3 A	+4.65 to +5.25 VDC, 1 A
603xE (PCI, PXI); except 6034E	1.5 A	+4.65 to +5.25 VDC, 1 A
6034E PCI-6036E	0.9 A	+4.65 to +5.25 VDC, 1 A
DAQCard-6036E	300 mA	+4.65 to +5.25 VDC, 0.75 A

Physical[1]

Dimensions (not including connectors)[1]
PCI ..... 17.5 by 10.6 cm (6.9 by 4.2 in.)
PXI ..... 16.0 by 10.0 cm (6.3 by 3.9 in.)
DAQCard ..... Type II PC Card

I/O connectors

6052E 6030E 6032E 6034E PCI-6036E	68-pin male SCSI-II type
6031E 6033E	100-pin female 0.050 D-type
DAQCard-6036E	68-position VHDCI female

Environment

Operating temperature ..... 0 to 55 °C; DAQCards should not exceed 55 °C while in PCMCIA slot
Storage temperature ..... -20 to 70 °C
Relative humidity ..... 10 to 90%, noncondensing

Certifications and Compliances

CE Mark Compliance CE

[1]See page 146 for RT Series device power requirements and physical parameters.